The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XXXI NOVEMBER 1943 No. 11.

EDITORIAL

Food Supply The supply of food to the country has become the foremost problem of the day, confronting the people and the Government. The shortage is great in certain provinces and states as in the case of Bengal, Cochin and Travancore. Bengal, essentially a rice growing area, is experiencing a severe famine on a scale never known before. The causes of the shortage of food are many. The supply of rice from Burma was cut off by the occupation of the country by Japan. The failure of the monsoon in certain areas, the present restricted transport facilities, the profiteer, the hoarder, the black market, the influx of evacuee populations from other countries etc, have combinedly contributed to the present shortage. People hold varying views about the causes of the shortage and try to single out one or two factors as being primarily responsible for the state of affairs and suggest certain remedies. The suggestions are not flawless and considerable practical difficulties are bound to be encountered in giving effect to them. The suggestion to Grow More Food by utilising every inch of land and facilities available and thereby increase the larder of the country appears to be the only one that is non-controversial. It behoves every individual to apply himself to this, the supreme task of the hour. Before the war, England was producing only 34 per cent of her food requirements and depended upon imports for the balance. She is today producing 60 per cent of her requirements. This has been possible in an industrial country actively participating in war, where every ounce of energy has to be spent in producing arms and ammunitions and for protecting the country. That food is as much a war material as anything else has been clearly recognised. Wastelands, lawns, public parks and pastures have been ploughed, and grains, vegetables and fodder grown on them in addition to augmenting the production of milk, bacon, beef, eggs, poultry etc. This should be possible in this country also, where people could apply themselves to their work undisturbed—a noble work viz. of providing food for the hungry.

The Madras Government are alive to the need for increasing production of food and are forging ahead. Large quantities of improved seeds are being produced in seedfarms distributed all over the presidency. Manures, especially oil cakes, are purchased and made available to the

poor *ryots* at the various agricultural depots. Considerable sums have been set apart for granting *thakkavi* loans to *ryots* for carrying on cultivation and for effecting land improvements. The development of irrigation has been taken up in earnest A special grant of one lakh of rupees has been set apart for each of the districts—Chittoor and the Ceded Districts, for developing well-irrigation. A large number of major and minor irrigation schemes costing over Rs 3 crores have been sanctioned and are being put through. All these, we presume would be continued even during the post-war period, to permanently benefit the country.

We are however aware that the primary agricultural producer has never had a square deal in the past and any extra price that he gets for his produce is all reasonable within limits. His labour is the most strenuous and he sustains as it were everybody else and yet his wages have been the lowest, when compared to his compeer in other walks of life. This disparity should disappear but by over-emphasising this sentiment, he should not be beguiled into exploiting others. The war has let loose relentless wolves on society and the process of making easy money regardless of its effects on human life, on human suffering and on the poor has become too common and exacting in the extreme. Racketeering, hoarding and profiteering are stalking the world leading to utter depravity and loss of human touch and the primary producer is also in danger of falling and succumbing to these temptations. Historians and sociologists will record that this war has been disastrous, not so much for destroying material goods, devastating countries, laying them waste and mercilessly exterminating countless millions of innocent lives, though these have had no parellel, as in destroying humanity itself We shudder to think of it and wish that the primary producer who depends largely upon Nature's gift at least, is not drawn into this whirlpool of depraved Humanity and may be left untainted.

D. Sc. to Rao Bahadur B Viswanatha We are glad to note that the Andhra University has decided to confer the honarary degree of 'Doctor of Science' on Rao Bahadur B Viswanath, C I. E, Director of the Imperial Institute of Agriculture, New Delhi, in fitting recognition of his fruitful and meritorious services in the field of agricultural Chemistry. Mr. Viswanath is one of the founders of the Madras Agricultural Students' Union and the Union is mighty proud of this distinction on one of her founders.

Viceroy of India His Excellency Lord Linlithgow, the Viceroy of India, laid down the reins of office after seven years of eventful service. From the time he led the Royal Commission on Agriculture in 1926, he has been evincing a keen interest in agriculture and livestock. The All India Cattle Show inaugurated by him has come to stay as a permanent feature of the country. We wish him a well-earned rest. We extend our welcome to his successor, His Excellency Viscount Wavell, who has so soon shown himself to be a man of action and on whom India may depend for her advancement.

A Review of the Manurial Experiments on the Agricultural Crops of the Madras Presidency for the Decennial Period 1930-40

By The Paddy Specialist and Govt. Agricultural Chemist, Coimbatore.

Introduction At the instance of the Imperial Council of Agricultural Research, a committee was constituted as early as 1930 to investigate the problems relating to the development and consideration of manurial resources and to launch a programme of research on artificial and organic fertilisers to suit the needs of crops grown in several parts of India. The committee at its meeting held in June 1930, deemed it necessary to have sufficient information on the results of the manurial experiments conducted throughout India, and consequently arranged with the Provincial Departments of Agriculture to collect necessary data and collate them for a review and to chalk out a programme later on, on the basis of the results achieved. The Government of Madras with the financial aid from the Imperial Council of Agricultural Research arranged to collect and compile the results of the manurial experiments of the province, from the inception of the Department of Agriculture, up to 1930. The report comprising as it does, the results of nearly quarter of a century, has given valuable information regarding the performance and utility of a good many indigenous manures and artificial fertilisers in regard to important crops of this province.

In earlier years most of the experiments were conducted according to the then prevailing technique for field experiments, either without suitable number of replications or in single plots all continuously extending over a number of years. The defect has since been rectified during the last decade after the compilation of the review referred to above with the result that more systematic experiments came to be conducted in all the agricultural research stations of this Presidency based on modern field technique, in accordance with the advice tendered by the Imperial Council of Agricultural Research, to enable strict and correct statistical interpretation of the results. The findings of the later experiments covering a period of ten years, 1930-40, were collated as desired by the local Research Council to assess their merits and to suggest fresh schemes of research on manures with suitable modifications. These manurial trials have, in general, proved to be of greater value than the earlier ones, and afforded information on the relative merits of the several manures, especially nitrogenous and phosphatic (organic as well as inorganic), on the major crops, viz., paddy, sugarcane, *cholam*, etc. The results achieved during this period may be said to have passed the stage of experimentation and to be fit for general adoption in the several tracts of the province.

In the present review an attempt has been made to set forth the results in a popular form for the guidance and adoption by the *ryots*, the general

aim being to furnish information regarding soil deficiency and the manurial requirements of the crops grown in any particular tract of this province.

Soils The soils of the Agricultural Research Stations in this province may be broadly classified as follows:—

1. The deltaic areas of the Circars, represented by the Samalkot and Maruteru stations, consist of deep fairly fertile clay. The tracts round about the Anakapalle farm which consist of light red loams are deficient in nitrogen and phosphoric acid. The general rotations adopted are double or single crop paddy followed by garden crops of short duration. Very often sugarcane is also grown both under swamp and semi-wet conditions in rotation with paddy.

2. South of Madras, in the district of South Arcot, the tract represented by Palur Agricultural Research Station, is typical of a strip of alluvial soil lying between the Pennar and the Gadilam rivers and is fairly rich in all essential plant foods except nitrogen. Major portions of this area are irrigated partially by channels from the Gadilam, while the dry lands are commanded by wells. Paddy and sugarcane are the chief crops grown under wet conditions. Groundnut forming the main crop of the dry land is cultivated in rotation with occasional cereals like *varagu* or *ragi* under irrigation.

3. The Tanjore delta represented by the Aduthurai Farm is generally deficient in nitrogen and phosphates but well supplied with potash. The main crop of the locality is paddy, single or double, usually with no rotation except for the occasional raising of pulse crops such as green or black gram succeeding paddy.

4. The black cotton soil area, mostly unirrigated, is represented by Guntur, Hagari and Nandyal in the north and Koilpatti in the south of the presidency. The prominent crop of these areas is cotton which is grown with different rotations common to the respective tracts. The soils of Guntur and Nandyal Stations are well supplied with essential elements of plant food including lime; while those of Hagari and Koilpatti are particularly deficient in nitrogen. The rotations followed in the above stations are, (i) in Guntur, cotton followed by *jonna* (sorghum) or chillies, tobacco followed by *sajja, variga*, groundnut, maize or dry paddy, (ii) in Hagari, sorghum mixed with Bengal gram followed by a mixture of Italian millet and cotton, (iii) in Nandyal, sorghum is cultivated with green gram, and (iv) in Koilpatti, cotton followed by fodder sorghum or *cumbu*.

5. Coming to the central districts represented by the Coimbatore Central Farm, two different soils, red and black, are quite common. The black soils are deficient in potash and phosphoric acid and the red soils rich in all the essential elements of plant food The general rotations practised in the farm are paddy after paddy (canal irrigated), *ragi*, wheat or sorghum (well irrigated), and dry crops—sorghum, Bengal gram, cotton, etc.

6. The West Coast soils, represented by the Pattambi, Kasaragod and Taliparamba stations ranging from sandy to heavy loams of laterite origin, are generally deficient in lime and phosphoric acid. Paddy is the main crop grown under rain-fed conditions at Pattambi, coconut in Kasaragod and spices, like pepper, at Taliparamba.

7. The clayey soils of the Nilgiris, represented by the Nanjanad Farm are also lateritic in origin very deficient in lime and phosphoric acid, besides being extremely acidic. The chief crop is potato, but *korali* and *samai* are grown in rotation and lupin cultivated as green manure crop.

It is also evident from the soil surveys so far conducted in this presidency that there is a general deficiency of organic matter, nitrogen and phosphoric acid in most of the cultivated areas.

The results of the manurial experiments during the decade have been classified according to the nature of the manures used in relation to different crops.

I. Inorganic fertilisers – (a) Nitrogenous and (b) Phosphatic manures

II. Organic Manures (a) Bulky manures e. g, green manures, composts, farm yard manure, green leaves, molasses, etc., and (b) Concentrated manures e. g., oil cakes—groundnut, neem, castor, etc.

Special attention has been devoted to the study of the performance of organic and inorganic manures when applied individually and in combination to the various crops with reference to the tracts already discussed.

The general findings of the present review reveal that the most efficient manures are green manures with or without phosphate for paddy, oil cakes for sugarcane and cattle manure for garden and dry land crops. The value of artificial fertilisers, except in the case of paddy and potato, are only of secondary importance. The behaviour of nitrogenous fertilisers by themselves has not been very satisfactory in most cases. In combination with organic manures either bulky or concentrated, the response of these artificial fertilisers have been found to be beneficial. This stresses the need for an adequate supply of organic matter in the soil for an efficient performance of the artificials. Superphosphate and bone meal are really useful to make up the phosphorus deficiency of soils and this has been confirmed by recent experiments. In combination with organic and nitrogenous manures super responds better and is invariably superior to bonemeal; but when supplied alone its response on crop growth is rather slow. The necessity for potassic fertilisers does not arise in this province as most of the soils are well supplied with this element to meet the normal requirements of staple food crops except perhaps in the case of crops like plantain and potato.

For the sake of convenience the results are discussed according to crops with reference to their behaviour to different types of manures applied, individually and in combination.

Paddy A good number of manurial experiments on this crop has been conducted in the agricultural research stations at Samalkot, Maruteru, Anakapalle, Aduthurai, Coimbatore and Pattambi, and these relate mainly to the study of nitrogenous and phosphatic manures.

(i) *Nitrogenous manures* It is a well established fact that the rice plant responds well to nitrogen in the form of ammonium sulphate, oil cakes or green manures. The beneficial effect of this plant food on the paddy crop in this province is quite striking as it may be evident from the results furnished in Table I for the different types of simple nitrogenous manures.

TABLE I Manurial experiments on paddy (i) Simple nitrogenous manures

Station	Treatment	Rate per acre in lb.	Available nitrogen in lb.	Normal yield per acre in lb.	Duration of the experiment in years	Percentage increase over control	Remarks
1. *Maruteru*	Ammonium sulphate	100	20	2,000	2	25	(1st crop)
	,,	do.	do.	1,500	3	28	(2nd crop)
	Oil cake—groundnut	225	16	1,500	3	23	,,
	,,	450	32	do.	3	38	,,
	,,	675	48	do.	3	51	,,
	Green manure	2,000	13	do.	3	15	,,
		4,000	26	do.	3	37	,,
	Green manure—both crops	2,000	13	do.	2	7	(1st crop)
						18	(2nd crop)
		4,000	26	do.	2	14	(1st crop)
						34	(2nd crop)
2. *Samalkota*	Ammonium sulphate	150	30	3,000	3	12	(1st crop)
	,,	do.	45	,,	3	18	,,
	Green manure	4,500	30	do.	4	12	(1st crop)
						27	(2nd crop)
	,, ,,	6,750	45	2,000	1	18	(1st crop)
						35	(2nd crop)
	,, ,,	4,000	27	3,500	3	9	(1st crop)
	,, ,,	6,000	40	do.	3	13	,,
3. *Anakapalle*	Green manure	3,000	20	2,300	11	12	
	,, ,,	4,000	26	1,800	2	21	
	,, ,,	6,000	39	do.	2	44	
	,, ,,	8,000	52	do.	2	51	
4. *Aduthurai*	Ammonium sulphate	100	20	2,500	3	12	(1st crop)
	,,	100	20	1,700	4	21	(2nd crop)
	,,	150	30	2,500	3	25	(1st crop)
	,,	150	30	1,700	4	34	(2nd crop)
	Nitrate of soda	200	30	2,500	2	12	(1st crop)
	Green manure	4,000	26	do.	4	9	,,

5. *Coimbatore—*							
Paddy Breeding Station							
	Ammonium sulphate	150	30	3,300	3	27	
	Nitrate of soda	200	30	2,100	1	7	
	Groundnut cake	750	30	2,400	3	20	
	Castor cake	750	30	do.	3	17	
	Green manure	4,500	30	do.	3	14	
	,, ,,	6,000	45	do.	3	17	
6. *Paltambi*	Ammonium sulphate	150	30	1,300	4	42	(1st crop)
	,,	150	30	1,700	4	34	(2nd crop)
	Nitrate of soda	200	30	1,300	1	17	(1st crop)
	Groundnut cake	212	15	1,700	4	14	,,
	,, ,,	425	30		4	30	,,
		212	15	1,600	4	9	(2nd crop)
	,, ,,	425	30		4	28	,,
	Castor cake	660	30	1 500	3	26	,,
	Neem cake	500	30	do.	3	19	,,
	Green manure	4,000	27	do.	3	15	,,
	,, ,,	5,000	33	1,300	5	42	(1st crop)
	,, ,,	,,	33	1,600	5	41	(2nd crop)
	,, ,,	8,000	53	1,800	1	27	,,
	Cattle manure	5,000	30	1,300	5	19	(1st crop)
	,, ,,	5,000	30	1,600	5	14	(2nd crop)

These experiments while indicating the need for adequate supply of nitrogen have also thrown light on the best method of applying plant food; ammonium sulphate, green manures and oil cakes have been found to satisfy the requirements of this crop in all the agricultural stations. The normal dose of nitrogen lies somewhere about 30 lb. for a good return of the crop with percentage increases ranging from 25 to 40 depending upon the nature of manure, the locality and the strain. The optimum dose is to be fixed at 150 lb. for ammonium sulphate to supply 30 lb. nitrogen; while for groundnut cake the relative dose is 425 lb. It is of interest to record the most efficient response of ammonium sulphate resulting in an increase of 35 to 40 per cent with Pattambi soil of laterite origin, consistently over a period of four years. Green manure has been the universal bulky organic manure which has been tried with beneficial results on all the stations. Its application in varying doses, 2,000 to 8,000 lb. per acre, has increased the yields of first and second crops according to the quantity of the manure applied. The optimum dose for all the stations appears to be within the limits of 4,000 to 6,000 lb. the percentage increase in yields varying from 25 to 45. Maximum response (40 to 50%) was noticed with an application of 6,000 to 8,000 lb. in the case of the Circars and West Coast soils (with second crops), and 9 and 17 per cent respectively for the Cauvery Delta and Coimbatore soils.

Different kinds of oil cakes have been tried to supply 30 lb. of nitrogen in most of the stations and the increases in yields are 38 per cent for Maruteru, 20 per cent for Coimbatore and 30 per cent with groundnut

cake at Pattambi. Groundnut cake may be advocated for all the areas of the province to supply 30 lb. nitrogen per acre. In an experiment conducted at Maruteru with groundnut cake (on second crop) at varying levels of nitrogen (16 lb., 32 lb, 48 lb.) a progressive response was noticed with incremental doses with a record yield of 51 per cent over control for the 48 lb. nitrogen level.

Among the artificials, nitrate of soda has proved ineffective when compared with other nitrogenous manures tried in most of the stations. It is neither economical nor beneficial to use it as manure for the crop. The bulky organic manures viz., cattle manure, molasses and composts, have been tried for periods up to five years in a few stations (Aduthurai and Pattambi), with no appreciable increase in yields, except perhaps, with cattle manure to supply 30 lb. nitrogen at Pattambi, showing a rise in the average yield to the extent of 14 to 20 per oent.

(ii) *Combination of nitrogenous manures* Experience has shown that the combined application of organic and inorganic manures at Coimbatore has proved more beneficial than either of these applied alone. The effect is particularly marked in areas with a pronounced deficiency of nitrogen as at Pattambi and Maruteru (Table II).

TABLE II Manurial Experiments on paddy (ii) Combination of nitrogenous manures

Station	Treatment and rate of application per acre	Available nitrogen in lb.	Normal yield per acre in lb.	Duration of experiment in years	Average percentage increase over control	Remarks
1. *Maruteru*	Green leaf 2,000 lb. *plus* ammonium sulphate 80 lb.	28	1,500 (2nd crop)	3	40	Increase for leaf only 15%
	Green leaf 2,000 lb. *plus* ammonium sulphate 160 lb.	44	do.	3	44	
	Green leaf 2,000 lb. *plus* ammonium sulphate 240 lb.	60	do.	3	56	
2. *Aduthurai*	Ammonium sulphate 75 lb. *plus* nitrate of soda 100 lb.	30	2,500	2	22	Increases due to ammonium sulphate only and sodium nitrate only are 26 and 12% respectively
	Ammonium sulphate 100 lb. *plus* nitrate of soda 67 lb.	30	do.	2	20	
	Ammonium sulphate 50 lb. *plus* nitrate of soda 133 lb.	30	do.	2	21	
3. *Coimbatore Paddy Breeding Station*	Ammonium sulphate 75 lb. *plus* nitrate of soda 100 lb.	30	2,600	2	19	Increase due to individual application of the respective manures—ammonium sulphate, sodium nitrate, green leaf, are 26, 7 and 14%
	Ammonium sulphate 100 lb. *plus* nitrate of soda 67 lb.	30	do.	2	22	
	Ammonium sulphate 50 lb. *plus* nitrate of soda 133 lb.	30	do.	2	11	
	Green leaf 2,000 lb. *plus* ammonium sulphate 100 lb.	32	3,000	2	10	
	Green leaf 2,000 lb. *plus* ammonium sulphate 200 lb.	52	do.	2	17	
	Green leaf 2,000 lb. *plus* ammonium sulphate 400 lb.	92	do.	2	31	

4. *Pattambi*	Ammonium sulphate 75 lb. *plus* nitrate of soda 100 lb.	30	1,200	1	26	Increases due to single manures (i) ammonium sulphate 32% (ii) sodium nitrate 17% (iii) Cattle manure 1·3% (iv) Castor cake 26% (v) Neem cake 19%
	Ammonium sulphate 100 lb. *plus* nitrate of soda 67 lb.	30	do.	1	27	
	Ammonium sulphate 50 lb. *plus* nitrate of soda 133 lb.	30	do.	1	27	
	Green leaf 4,500 lb. *plus* ammonium sulphate 75 lb.	45	1,460	3	60	
	Green leaf 2,500 lb. *plus* groundnut cake 212 lb.	30	1,600	4	19	
	Cattle manure 2,500 lb. *plus* groundnut cake 212 lb.	30	do.	4	21	
	Castor cake 750 lb. *plus* ammonium sulphate 75 lb.	45	1,460	3	59	
	Groundnut cake 425 lb *plus* ammonium sulphate 75 lb.	45	do.	3	63	
	Neem cake 500 lb. *plus* ammonium sulphate 75 lb.	45	do.	3	55	

Experiments conducted with a combination of simple artificials like ammonium sulphate and nitrate of soda to supply 30 lb. nitrogen in varying proportions at Aduthurai, Coimbatore and Pattambi have given only an increased yield of about 20 per cent over control, but in no case superior to that of ammonium sulphate applied individually. Considering the deleterious after effect of such a combination, particularly nitrate of soda, in the long run, it is not desirable to adopt this in practice.

However an application of ammonium sulphate (75 lb. or 15 lb. nitrogen) over a basal dressing of green leaf (2,000 lb.) has yielded 40 per cent over the control at Maruteru; while with the increased doses of the artificial supplying 16, 32, and 48 lb. nitrogen, the increases ranged between 40 to 56 per cent during a three year trial. A phenomenal increase of 60 per cent has been recorded at Pattambi consistently for a period of three years when nitrogen is applied at 15 lb. level as ammonium sulphate (75 lb.) in combination with green leaf at 4,500 lb. In conjunction with oil cakes more marked response has been observed in the same station for ammonium sulphate when the ratio of organic to inorganic nitrogen is 2:1, the total being 45 lb. nitrogen. The increased yield ranged between 55 to 63 per cent for the various combinations of ammonium sulphate with neem, castor and groundnut cakes with the second crop of paddy.

Thus it would appear that a judicious combination of organic and inorganic manures viz., green leaf at 4,500 lb. *plus* ammonium sulphate 75 lb. (15 lb. N.) or oil cake to supply 30 lb. nitrogen plus ammonium sulphate 75 lb. (15 lb. N.) is best suited for paddy crop. In no case a combination of artificials alone is to be resorted to for the soils of this presidency under paddy to supplement their nitrogen requirements. An adequate supply of organics must be ensured to obtain maximum benefit with artificials.

(iii) *Phosphatic manures* Phosphate is an essential plant nutrient for the production of good quality grain; consequently, its application in adequate amounts to soils deficient in this constituent would appear to be necessary. Phosphatic manures like super, bone meal, bone jelly, Kossier

phosphate, etc. when applied individually at 30 lb. level of phosphoric acid in a few stations, viz, Coimbatore and Aduthurai, have not shown any appreciable increase in yield, the maximum ever met with being about 17 per cent over control at Coimbatore, whereas at Aduthurai the percentage increases have fluctuated between 5 and 11. The behaviour of these fertilisers by themselves towards paddy crop is rather erratic, and as such they cannot be safely recommended. Phosphatic manures in general respond better in combination with organic or inorganic nitrogenous manures, such as green leaf and ammonium sulphate (Table III).

TABLE III. Manurial experiments on paddy

(iii) Combination of nitrogenous and phosphatic manures

Station	Treatment and rate of application per acre	Available constituents in lb.		Normal yield per acre in lb.	Duration of experiment in years	Percentage increase over control	Remarks
		Nitrogen	Phosphoric acid				
1. *Samalkota*	Ammonium sulphate *plus* super phosphate						
	„ 150 lb. „ 167 lb.	30	30	1,900	4	26	Increase for 30 and 45 lb. N. as am. sulphate – 12% & 18%
	„ 225 lb. „ 167 lb.	45	30	3,000	2	27	
	„ 150 lb. „ bone meal 136 lb.	30	30	do.	2	14	
	„ 225 lb. „ „	45	30	do.	2	21	
	Niciphos	30	30	1,900	4	29	
	Green leaf 4,500 lb. „ super-phosphate 167 lb.	30	30	do. (2nd crop)	4	31	
	„ 6 750 lb. „ „	45	30	2,000 (2nd crop)	1	38	Green leaf – 45 lb. N. gives 35% increase
	„ 4,500 lb. „ bone meal 136 lb.	30	30	do.	1	24	
	„ 6,750 lb. „ „ „	45	30	do.	1	28	
	„ 2,250 lb. „ ammonium sulphate 75 lb. *plus* super 167 lb.	30	30	1,900	4	33	

Note. Absence of response to super in combination with green leaf on this station is evidently due to the presence of this constituent in the soil above the normal limit. (cf. Table I for green leaf only).

							Percent increase over—	
							No manure	Leaf
2. *Maruteru*	Green leaf 2,000 lb. *plus* super phosphate 178 lb.	12	32	1.400	3	25	18	
	„ „ „ niciphos	28	16	1,500	2	38	18	
	„ „ „ „	44	32	do.	2	58		
	„ „ „ „	60	48	do.	2	54		

	Groundnut cake 212 lb. } *plus* flour phosphate 178 lb.	16	16	do.	3	17	23
	,, 425 lb. ,, ,,	32	32	do.	3	36	38
	,, 637 lb. ,, ,,	48	48	do.	3	55	51
	,, 212 lb. ,, milled guano	16	16	do.	3	18	23
	,, 425 lb. ,, ,,	32	32	do.	3	41	38
2. *Maruteru*	Green leaf 2,000 lb. *plus* am. sulph. 80 lb. *plus* superphosphate 90 lb.	28	16	do.	3	33	39
	Green leaf 2,000 lb. *plus* am. sulph. 160 lb. *plus* superphosphate 180 lb.	44	32	do.	3	56	44
	Green leaf 2,000 lb. *plus* am. sulph. 240 lb, *plus* superphosphate 270 lb.	60	48	1,500	3	Increase over no manure 54	
	Green leaf 2,000 lb. *plus* am. sulph. 40 lb. *plus* niciphos	36	16	do.	3	47	
	Green leaf 2,000 lb. *plus* am. sulph. 80 lb. *plus* niciphos	44	16	do.	3	49	
3. *Aduthurai*	Ammonium sulphate } *plus* conc. super					Increase due to N N+P_2O_5	
	100 lb. 50 lb.	20	20	2,500	4	11 26	(1st crop)
	,, ,,	20	20	1,700	4	21 26	(2nd crop)
	150 lb. 75 lb.	30	30	2,500	4	25 37	(1st crop)
	,, ,,	30	30	1,700	4	34 36	(2nd crop)
	,, 50 lb.	30	20	2,500	4	25 37	(1st crop)
	,, ,,	30	20	1,700	4	34 36	(2nd crop)
	100 lb. 75 lb.	20	30	2,500	4	11 38	(1st crop)
	,, ,,	20	30	1,700	4	21 31	(2nd crop)
	Ammonium sulphate *plus* bone meal 100 lb. 180 lb.	27	40	1,800	3	7	
	Green leaf 2000 lb. *plus* superphosphate 112 lb.	12	20	2,100	1	25	
	Green leaf 4000 lb. *plus* bone meal 200 lb.	31	40	1,800	3	7	
	,, ,, Bone jelly	31	40	do.	3	7	
	Green leaf 2,000 lb. *plus* am. sulphate 150 lb. *plus* super 150 lb.	42	30	2,000	1	20	
	Green leaf 4,000 lb. *plus* am. sulphate 65 lb. *plus* bone meal 180 lb.	44	40	1,800	3	16	
4 *Coimbatore– Paddy Breeding Station*							Increase due to green manure
	Green leaf 4,000 lb. *plus* superphosphate 112 lb.	24	30	3,000	2	19	10

5.	*Pattambi*						Leaf alone
	Green leaf 4,000 lb. *plus* bone meal 168 lb.	31	30	1,800	3	21	17
	Green leaf 4,000 lb. *plus* superphosphate 112 lb.	24	30	1,700	3	21	11
	Green leaf 2,000 lb. *plus* am. sulph. 150 lb. *plus* super 112 lb.	42	30	1,500	4	12	(1st crop)
	Green leaf 2,000 lb. *plus* am. sulph. 150 lb. *plus* super 112 lb.	42	30	1 800	4	15	(2nd crop)
	Green leaf 4,000 lb. *plus* ammophos	42	30	1,750	3	23	
	Green leaf 2,000 lb. *plus* am. sulph. 125 lb. *plus* kossier phosphate	37	45	1 800	1	13	
	Green leaf 2,000 lb. *plus* am. sulph. 125 lb *plus* steamed bone meal	37	45	1,800	1	15	

Experiments with a mixture of nitrogenous fertilisers like ammonium sulphate and super to supply varying amounts of nitrogen and phosphoric acid at Samalkot and Aduthurai have shown increased yields of 26 and 36 per cent respectively. A combination of bone meal and ammonium sulphate under similar circumstances has proved ineffective in increasing the yields. The rise in the several cases ranges from 7 to 14 per cent only.

Phosphates, preferably super, in combination with organics like green manure and oil cakes have responded better than when applied alone. With incremental dosages of green manures in the presence of a constant amount of phosphoric acid, the yield is enhanced. Experiments with a constant level of phosphoric acid (30 lb.) and varying amounts of green manure or with a basal dose of the same at 2,000 lb. have given increased yields in most of the stations from 20 to 38 per cent over control. Between bone meal and super it is advantageous to apply the latter along with green manure or any other organic nitrogenous manure.

With regard to niciphos which is in itself a nitrogenous and phosphatic fertiliser, a rise of 30 per cent over control has been recorded at Samalkot when applied to provide 30 lb each of nitrogen and phosphoric acid. Its combination with green leaf at 2,000 lb. to supply 16, 32 and 48 lb. of nitrogen and phosphoric acid has resulted in a maximum increase of 58 per cent for the 32 lb. combination at Maruteru during a two year trial.

The other miscellaneous phosphates such as flour phosphate and milled guano have also been tried for over three years at Maruteru in combination with oil cakes to supply 16, 32 and 48 lb nitrogen and corresponding amounts of phosphoric acid. Both the manures have behaved alike and the increases are progressive with the additional dosages of phosphoric acid. The maximum yield of 55 per cent has been observed for flour phosphate (837 lb) supplying 48 lb. phosphoric acid ;

whereas a rise of 41 per cent. is noticed for 425 lb. milled guano (32 lb. phosphoric acid).

Further experiments with different types of phosphates, viz, super, niciphos, ammophos, bone meal, kossier phosphate, etc. in combination with green leaf and ammonium sulphate have also given striking increase in yields except at Pattambi and Aduthurai, wherein the results are comparatively lower than for a simple combination of super with green leaf or ammonium sulphate.

These experiments in general go to show that more beneficial application of phosphoric acid is when it is done along with suitable nitrogenous manures like green leaf, cakes or a combination of both.

The trials on the combination of nitrogenous and phosphatic manures, e. g. green manure *plus* super or cake *plus* super in varying doses, have not increased the yields appreciably, when compared to the performance of nitrogenous manures by themselves. This does not however minimise the importance of phosphate application to soils of this presidency which are likely to be depleted further of this plant food by continuous cropping. For the maintenance of normal crop production it is absolutely necessary to resort to periodical addition of phosphates preferably in conjunction with bulky organic manures like green manure and oil cake, though appreciable increases have not been recorded for its addition in the experiments so far reviewed.

The time of application Experiments have been in progress at most of the stations to find out the best time of application of manures to paddy, especially nitrogen and phosphate, either alone or in combination with green leaf in varying doses. The time of application varied from the commencement of planting up to flowering stage. The results of the trials indicate in general no beneficial effect due to the variation in the period of application beyond a month after planting.

At Coimbatore the application of 30 lb. nitrogen as ammonium sulphate split up into single, double and triple doses, at planting or 3, 6 and 9 week intervals has not affected the yields in any way except for 9 week period, wherein an increased yield of 30 per cent (as against 26 per cent at planting) has been recorded over the normal of 3,400 lb. In other treatments the increase in yield is about 20 per cent over the average.

At Maruteru also the application of green manure (basal 2,000 lb) and ammonium sulphate (32 lb. nitrogen) at planting has increased the yield of paddy by 44 per cent over control. When the dose is split up and applied in equal parts one at planting and the other 30 days later the percentage increase has gone up to 61. In another experiment at Coimbatore wherein varying doses of ammonium sulphate at 20, 40 and 80 lb. nitrogen levels were applied over a basal dressing of green leaf, no difference was observed in crop yields due to the splitting of the dosages and their application at different periods. (Table IV). However there is a progressive increase in

yield with higher levels of nitrogen and the time of application would appear to have no special advantage on the paddy crop under Coimbatore conditions.

TABLE IV Time of application of manures experiment *(Ammonium sulphate)*

Station	Treatment	Time of application	Duration in years	Percent increase over control
Coimbatore Paddy Breeding Station	Green leaf 2 000 lb. (basal dressing) *plus* ammonium sulphate at varying levels of nitrogen from 20 to 80 lb.	(a) 20 lb. nitrogen in single and divided doses 10, 5 and 2½ lb. at intervals—10 to 45 days	2	10 to 12
		(b) 40 lb. nitrogen in single and divided doses 20, 10 and 5 lb. at intervals—10 to 45 days	2	17 to 20
		(c) 80 lb. nitrogen in single and divided doses 40, 20 and 10 lb. at intervals—10 to 45 days	2	30 to 40
	Normal yield—3,000 lb. per acre			

At Pattambi the application of ammonium sulphate to supply 30 lb. nitrogen distributed in single and double doses over a basal dressing of green leaf (2,000 lb.) and super (1 cwt.) at varying intervals has resulted in an increase of 27 to 28 per cent for a single dose addition, one month after planting, as compared to 15 per cent at planting. The incorporation of the manure at other intervals either in single or divided doses has not been so effective as the previous one (*vide* Table V). In a single experiment at Aduthurai and Maruteru an increase of 57 per cent has been recorded for a similar application of ammonium sulphate during a three year trial.

TABLE V Time of application of artificials *(Ammonium sulphate)* at Pattambi

Treatment	Time of application	Duration in years	Percentage over control	
			1st crop	2nd crop
Green leaf 2.000 lb. super to supply 30 lb. phosphoric acid and ammonium sulphate at 30 lb. nitrogen applied in varying doses at different intervals	(A) Single dose			
	(i) At planting	3	12	15
	(ii) One month after planting	3	27	28
	(iii) Two months after planting	3	13	17
	(B) In two doses			
	(i) 15 lb. nitrogen at planting *plus* 15 lb. one month after planting	3	21	20
	(ii) 15 lb. nitrogen at planting *plus* 15 lb. two months after planting	3	17	26
	(C) In three doses—10 lb. at planting *plus* 10 lb. one month after planting *plus* 10 lb. two months later	3	16	27
	Normal yield—1st crop 1,500 lb., 2nd crop 1,700 lb. per acre			

It is evident from these trials that the addition of ammonium sulphate in a single dose (150 lb.) one month after planting either alone, or with a

basal dressing of green leaf, or green leaf *plus* super is the best of all the treatments for getting the maximum yield of the crop.

As for the time of application of super it is observed from the experiments at Coimbatore that its addition in a single dose at 30 lb. phosphoric acid or in combination with green leaf at the time of planting has responded better giving a maximum rise in yield of 17 per cent over control (2,400 lb.) when compared to the yields of other periods which are quite negligible. In another experiment wherein the reaction of super (30 lb. phosphoric acid) added at the time of planting with green leaf (6,000 lb.) applied simultaneously and at 10 and 20 days before planting, was studied, it was noticed that interaction between the manures was not felt to an appreciable extent for any of the periods of decomposition of green leaf. The percentage increases for the three different periods of decompsition are more or less alike lying between 30 and 35 per cent over control; while super alone applied at the time of planting has yielded 7 per cent more.

Residual effect Experience on the manuring of paddy has revealed the absence of any residual effect of nitrogenous manures of any type in particular on the succeeding crop. This emphasises the need for renewed application of these manures every time the crop is raised.

(To be continued)

Commercial Cane Sugar Value and its Importance

By W. THIRUMALA RAO, B. Sc. (Ag.)
and
K. SRIRAMAN, B. Sc. (Ag.),
Agricultural Research Station, Anakapalle.

Commercial cane sugar value Sugarcane consists mainly of juice and fibre. Of the constituents of the juice, sucrose forms the major part. The sugar that we daily use, is mainly sucrose. It is not all the sucrose of the sugarcane juice that can be bagged for use. A fraction of it goes to waste. The maximum amount of sugar that can be manufactured from a cane of known analysis is called the "commercial cane sugar value" (C. C. S.), or the "available sugar". This recovery of sugar depends upon (1) the efficiency of the machinery, (2) the skill of the factory superintendent, (3) nature of the cane, and (4) the quality of the juice. Of these, the quality of the juice is the most important factor. The sugar is manufactured in the field by the cane and the processes in the factory are only of secondary importance. Taking the quality of the juice alone into consideration, it is found that the "available sugar" varies with factors like (1) the fibre content of the cane, (2) the total amount of sucrose present, and (3) the proportion of sucrose to that of the soluble matter in the juice. After long research and experience, formulae have been evolved to forecast the amount of sugar that can be manufactured under efficient conditions with a

given variety of cane. Of these the one recommended by R. Srivatsava is both simple and reliable for Indian conditions. The formula is :—

$$C.C.S. = \frac{3P}{2}\left(1 - \frac{10+F}{100}\right) - \frac{B}{2}\left(1 - \frac{6+F}{100}\right)$$

where P=polarisation of juice, B = corrected brix of the juice, and F = % fibre content in cane.

Its application Of the numerous varieties of sugarcane grown in the different parts of the country the choice of the best variety for a particular locality is beset with many difficulties both for the breeder and the actual grower. It is well-known that the growth and hence the tonnage as well as the composition of the juice of the different varieties of cane are influenced by the soil, climate and treatment. The farmer naturally would prefer to grow a cane which yields a high tonnage, whereas the factory people would prefer canes that yield high sugar recoveries. Only very few varieties of cane evolved so far satisfy both these requirements. For instance, B. 208 has got a high C. C S. value of 14 % nearly, whereas the yield is only about 25 tons per acre. J. 247 and Co. 213 yield more than 35 tons per acre, but the C. C. S. value is below 10 % under Anakapalle conditions. Under the present conditions of shortage of food grains when the "grow more food" campaign is being carried on vigorously and extensively, a cultivator would set apart only a limited portion of his land for the cultivation of sugarcane and hence to satisfy the requirement of the country for sugar it is very necessary to grow varieties which combine in them tonnage with high sugar content. That is not all. The duration of the season for crushing is another important factor, to reckon with; the longer the crushing period, the less will be the cost of production of sugar and hence more beneficial. The selection of a number of varieties which come to maturity at different periods, thereby assuring material to keep the factories going for at least four months, and possess a high C. C. S. value should be the aim of the cane breeder. As the monthly determination of the C. C. S. values of the varieties that are grown at the Anakapalle station will be of help in the selection of suitable types, this investigation was undertaken.

Materials and results Important varieties of sugarcane grown on the Agricultural Research Station, Anakapalle, have been analysed for their C. C. S. value and the results of some of them are presented in Table I. The yield records also have been noted side by side. Though data for a continuous period of three years, for each of the varieties of cane, have been gathered, the data for one particular year alone have been presented as they are representative of the other two.

Discussion The actual recovery of sugar in most of the factories in India, is between 8 to 10% only. Table I shows 12 to 13% as recoverable sugar, which may seem to be rather high. The results presented are those obtained from quality canes grown under improved methods of cultivation and manuring in an agricultural research station located in a fertile area

and naturally the quality of the juice is good and the C. C. S. values are high. The factories may not be able to secure such good quality cane for crushing on a large scale and therefore the C. C. S. values obtained at this station may be beyond the reach of factories at present. But if the canes are assessed on their C. C. S. values and the price paid is related to these values, then the quality canes are bound to spread quicker and simultaneously also the methods of cultivation practised improve. Such encouragement given to the growers will ultimately raise the C. C. S status of canes of India as a whole which is, at present, much lower than that of Java and Queensland.

TABLE I Commercial Cane Sugar value

Variety of Sugarcane	Yield in tons per acre	Commercial cane sugar value—per cent								
		October	November	December	January	February	March	April	May	June
Co. 213	38	1·30	5·65	8·96	9·68	9·67	9·68	7·72	6 17	4·50
Co. 312	47	...	6 94	7·58	9 63	10·32	10·90	9 17	...	...
Co. 313	33	6 87	10 24	12·19	12·39	11·43	10 76	9·23	7·29	5·61
Co. 419	55	5 54	8 33	9 97	10·63	12·26	12·42	10·95	9·84	9 19
Co. 421	42	5·66	9·22	10·93	12·27	11 69	10·35	10·26	9·12	7·88
Co. 443	42	...	8 82	10·18	11·93	12·76	12·35	11 60	...	...
Co. 508	37	8 70	10·73	12 96	12 68	13·70	12·95	13·35	12·17	9·81
Co. 523	42	...	9·37	10·03	11·02	11·38	11 39	11·20	...	...
Co. 527	43	...	8 46	10·96	12 07	12 45	12 12	12 14	...	...
Poj. 2878	34	6 11	9·72	13 12	12 59	14 05	11 34	11·36	6·51	7·56

The season is from March to March normally. C. C. S. values above 10% is considered desirable from the point of view of factory.

"Commercial cane sugar values" alone do not determine the choice of varieties. The amount of sugar that can be manufactured from an acre of land, and the capacity of the cane to maintain this value for at least four months has also to be considered and should be the criteria in the selection of varieties for a locality. The figures given in Table II below, represent the approximate amount of sugar that can be manufactured from an acre of sugarcane crop.

TABLE II Approximate amount of Available sugar—tons per acre

$$\frac{\text{C. C. S. \%} \times \text{Yield}}{100}$$

Variety	November	December	January	February	March	April	May
Co. 213	2·2	3·4	3·7	3·7	3·7	2·9	...
Co. 312	3 3	3·6	4·5	4 9	5·1	4·3	...
Co. 313	3·4	4·0	4·1	3·8	3·6	3·1	...
Co. 419*	4 6	5·5	5·9	6·7	6·8	6·0	5·4
Co. 421	3·9	4·6	5·2	4 9	4·4	4·3	...
Co. 443*	3·7	4·3	5 0	5·4	5·2	4 9	...
Co. 508*	4 0	4 8	4 7	5·1	4 8	4·9	4 5
Co. 523	3·9	4·2	4·6	4·8	4·8	4·7	...
Co. 527*	3·6	4·7	5·2	5·4	5·2	5·2	...
Poj. 2878	3 3	4·5	4·3	4·8	3·9	3·9	...

It will be seen from Table II above that (1) varieties like P. O. J. 2878 and Co. 313, though rich in C C. S. value do not give high yields of sugar per acre, because of their low tonnage, (2) some varieties like Co. 421, Co. 312, and Co. 443 mature a little late as compared with varieties like Co. 527 and Co. 508, (3) the profitable nature of the cane (asterisks in Table II) lasts for a longer period in some varieties like Co. 419, Co. 508, Co. 527 and Co. 443, while it lasts only for a short time, as in Co. 421, Co. 312 and P. O. J 2878. Taking all these factors into consideration, the factory can programme to crush for a period of at least four to five months, manufacturing the maximum amount of sugar from a minimum area, thereby profiting themselves and the farmer.

There is yet another use for the "commercial cane sugar value". It concerns the farmer, who manufactures jaggery out of the juice. The C. C. S. values have been found to indicate, within a difference of 1 %, the recovery of jaggery. With the aid of the C. C. S. values the farmer can easily determine the best period for harvest and also estimate the amount of jaggery that can be obtained from the different varieties of cane.

Conclusions The ideal of manufacturing more sugar from a limited area, can be achieved only by choosing varieties of high C. C. S. value, tonnage and the duration of the profitable yield. The yield of sugar per acre is of great utility in deciding varieties of cane to be grown. By a careful and critical study of the figures month-war, the crushing period of the factory can easily be extended from four to five months at least. Under the Anakapalle conditions Co. 419, Co. 508, and Co 527 seem to be most profitable to keep the factories going for about five months in the year and it is likely that the period can be prolonged by pursuing this investigation further for a search for early and late varieties that can be crushed with profit before December and after April.

This investigation, which is of a preliminary nature, indicates a method by which choice of canes may be made, under conditions obtaining round about Anakapalle, for supplying to the sugar factory spread over a period of about five months. It is also of great help to the jaggery manufacturer as the recovery of jaggery can be forecast with only a slight margin of difference. Similarly selection of varieties which satisfy the primary condition of profit to the cultivator as well as the manufacturer by permitting a continuous programme of crushing, well suited to the weather conditions of the tract and able to withstand the incidence of pests and diseases can be made in respect of other important cane growing tracts.

Acknowledgments Our thanks are due to the Government Agricultural Chemist, Coimbatore and the Superintendent, Agricultural Research Station, Anakapalle, for having given us the necessary guidance and facilities for pursuing this investigation.

The Mango shoot-webber—*Orthaga exvinacea* Hmpsn. and its control

By M. C. CHERIAN AND K. P. ANANTHANARAYANAN,
Agricultural Research Institute, Coimbatore.

Introduction Of the caterpillar pests affecting mango shoots, *Orthaga exvinacea* Hmpsn. a pyralid, is the most important. Little or no connected account of the pest exists excepting for scattered references made by Hampson (1896), Fletcher (1914) and Ramakrishna Ayyar (1932; 1940). A record of the observations on the pest made over a period of two years is presented in this paper.

Distribution and occurrence The insect is known to occur throughout the Madras Presidency and is recorded as a pest. At Coimbatore, it is fairly serious from February to October though it is sparsely evident at other periods.

Nature of damage The caterpillars destroy the foliage a great deal. A badly affected tree can be recognised even from a distance, by the presence of numerous clusters of webbed leaves. The leaves wither and dry up and are often found loosened from their stalks but held together by webs. The trees which bear such clusters of affected leaves, present a sickly appearance. The pest seems to have no special preference to any particular variety of mango. Young trees are subject to more severe attack than old ones.

Life history The female moth reared in captivity lays eggs in small clusters on the silken strands of the webs of attacked shoots. When laid on the leaf, they are laid singly near the ribs of the leaf. Thirty to fifty eggs are laid by a single moth in seven to nine clusters.

Egg The egg is yellowish green in colour, matching with the colour of ribs of leaves; when laid on leaf, it is oval and somewhat flat, but when in clusters, the eggs overlap and are glued in mass and the true shape of individual eggs is not revealed. In two to three days, the eggs take a pinkish colour owing to the transparent shell allowing the colour of the developing caterpillar to be seen. The eggs hatch in four days.

Larva The newly hatched caterpillar is pale greenish in colour with pale white head and blackish prothorax. The first abdominal segment has a clearly marked pink transverse band. The abdominal region as a whole has numerous light and irregular pinkish lines especially at the lateral region. The whole body is covered with isolated whitish hairs which are thin and fairly long, and arise from light dark warts on the body. The caterpillars in the young stages are gregarious and begin to feed on the foliage by scraping the green matter. They wriggle on hatching from the old webs and slowly reach the foliage nearby. Small patches of green

matter on leaves are gnawed, and soon a tunnel of thin webs is made, within which the caterpillars remain. While extending the area of attack on the leaf the extent of the tunnel of webs is also increased slowly. The caterpillar moults five to seven times and in captivity takes one month to go into the next pupal stage.

The full grown caterpillar measures about 3·5 cm. The head shield is brownish with dark motlings. Prothorax is as broad as head, pale with less dense markings. In the body, there are two dark bands, one longitudinal, and the other across the hind border of the prothorax. The mid-dorsal area is pale greenish white or light pale greenish. The setae are thin and inconspicuous but arise from clear black warts arranged in rows. The five pairs of prolegs are slender and pale white, with the crochets arranged in a circle The caterpillar is very active and always lives in tunnels of webs. In the grown-up stage, it makes holes in the leaf, and many a leaf in the webbed cluster is reduced to mere ribs. Only a single caterpillar or two are found in a webbed cluster. When disturbed from the folds of leaves it treads forwards or retreats backwards, and with a characteristic bending and wriggling of its body, skips off the leaf into the air and drops by a long silken thread which may be sometimes one to two yards long It suspends, itself dexterously on this strand which is produced to required length with marvellous rapidity, and the caterpillar uses it to climb back to the same web of leaves. The silken thread itself is very delicate, thin, inconspicuous and made visible only by the hanging caterpillar below. It takes an hour or more for the caterpillar to regain its normal position on the leaf. The grown-up caterpillar is a voracious feeder. It nibbles the edges or bites large holes, deserts old clusters and forms new ones binding fresh leaves. The signs of active feedings are manifest by the presence of numerous fresh green castings scattered on the strands. The leaves in cluster, denuded of green matter, or nibbled to the ribs, or clumsily bound together by webs, dry prematurely and the whole cluster of leaves may fall to the ground or remain suspended on the tree The caterpillar before pupation, becomes dull and shrunk in size.

Pupa Now and then a pupa or two may be found inside a cocoon made of silken thread and castings, within the folded or webbed foliage. But in cages, provided with soil, the caterpillars have been noted to form freely cocoons of silk and sand grains, and these lie almost at the surface, barely half buried in soil. Sometimes three to five days are spent in making a suitable strong and tough cocoon of silk, within which it lies in a curled up posture. The normal pupa is brown and about 13 mm. long. The emergence of adult takes place in 11 to 14 days. The adult moth, after emergence, lives in captivity for four to five days.

Natural enemies A carabid beetle *Parena loticincta* Bates and also a reduvid bug *Occama* sp. have been noted feeding on young and old caterpillars. Both of these live long, and form no inconsiderable check on the pest. It is a common observation that these caterpillars are scarce or

absent in trees infested by the red ant *oecophylla*. In addition to the predators a braconid parasite *Hormius* sp. has also been once reared from pupating caterpillars.

Control Systematic handpicking of affected clusters with the contained insects and destroying them, forms one of the best remedies to minimise damage. The affected twigs with young or old caterpillars can be easily collected.

Spraying the foliage with calcium arsenate ($\frac{1}{2}$ oz. calcium arsenate in one gallon of water) has given satisfactory results. The caterpillars feed on the poisoned leaves and eventually die.

References

Fletcher (1914) *Some South Indian Insects*—pages 429–30. Hampson (1896)—*Fauna of British India* Vol. 4 page 125. Ramakrishna Ayyar, T V. (1932)–*Bul. No. 27, Department of Agriculture, Madras*; –do.– (1940)—*A Handbook of Economic Entomology for South India*, page 289.

SELECTED ARTICLE

Some Plants Poisonous to Livestock

By NARAIN DAS KEHAR, M. Sc., Sc. D.,
Animal Nutrition Section,
Imperial Veterinary Research Institute, Izatnagar

Poisoning of livestock may be caused either by some of the flowerless plants such as fungi, lichens, etc., or by flowering plants such as the gramineae and leguminosae. This article deals with plants of the second group only, inasmuch as they are more extensively concerned with the poisoning of livestock.

The history of poisoning by plants in India can be traced to the remote past. The earliest mention is to be found in the *Rig Veda*, which is one of the oldest repositories of human knowledge, while further details may be gleaned from the *Charaka Samhita* and the *Shushruta Samhita*. Although some poisonous plants are protected by an unpleasant odour, an acid or bitter taste, or by spines, the poisoning of animals by such plants is of common occurrence, in spite of the widespread belief that they are protected by some instinct against eating dangerous plants. The important contributory factors incidental to poisoning are: (1) the ingestion of wilted, frosted or defoliated plants during drought, (2) the scarcity of palatable fodder during winter and early spring, (3) fatigue in transport and draught animals, (4) lack of salt, (5) a depraved appetite, (6) the fact that poisonous plants often grow in close association with palatable fodder, (7) the importation or transport of animals to new surroundings, and (8) the ingestion of poisonous plants along with hay.

Enormous losses It appears therefore that in a country such as India where a balanced feed is rarely available to animals where pastures are over grazed and grazing grounds are infested with poisonous plants, an enormous percentage of the cattle population is exposed to the dangers of poisoning. It seems, however, difficult to obtain reliable figures with regard to livestock losses sustained by plant poisoning, as only those cases are reported in which a large number of animals are involved.

The annual loss due to plant poisoning in animals in the U.S.A. is estimated to exceed $ 200,000,000 and in some years they may be even greater. In one

extensive outbreak in Texas, it was estimated that during one spring alone animals valued at $ 300,000 died from the effect of a single species of plant. Individual losses involving five to ten thousand dollars are not uncommon, while losses involving smaller amounts occur continually throughout the length and breadth of the country. Similar reports of heavy losses have been made in England, South Africa, Australia and Germany.

The death of stock is not the only loss caused by the poisonous plants; consequent losses may be manifested in the form of: (1) a drop in milk yield, (2) the loss of milk and flesh, (3) the loss of milk and wool in sheep, (4) the loss of condition in horses, (5) losses due to the action of poisonous plants on the foetus, causing either its expulsion as a result of the contraction of the uterus or its death, (6) sterility, (7) losses due to temporary or permanent injury to different organs, such as the heart, gastro-intestinal canal, kidney, liver, salivary glands and the eyes, (8) disturbances in the processes of metabolism, and (9) deformities in hoofs.

Hydrocyanic acid producing plants It is not to be expected that the losses due to plant poisoning are less in India than in the other countries mentioned above, especially as the plants incriminated in other countries also exist in India. According to the work of Chopra and Badhwar, at least 700 poisonous plants are known to exist in India even at the present day. It appears that the reason why stock poisoning cases are not brought to the public notice is that in all probability a very large number of cases and even outbreaks of plant poisoning pass unrecognized and thus remain univestigated.

It is not possible to deal with the large number of plants that are poisonous to stock but brief mention will be made only of poisoning due to some of the important hydrocyanic (prussic) acid producing plants, which form a major portion of the food of animals and are highly relished by them. *Sorghum vulgare* Pers. (*jowar*), *Sorghum halepense* Pers. (Johnson grass, *dadam*) *Sorghum vulgare sudanese* L. glax. (Sudan grass), *Triglochin maritimum* Linn. (arrow grass), *Trifolium repens* Linn. (white clover) and *Zea mays* Linn. (maize) ordinarily form nutritious fodders, but under certain climatic and soil conditions, especially in times of drought or when the plants are wilted, stunted or young they develop dangerously large quantities of hydrocyanic acid which is highly poisonous to all stock.

It is a common practice to put stock out to graze cut-over fields in the late summer and autumn and the regrowth is much relished by the animals on account of its succulent saline character and its freedom from stems. Herein, however, danger lies, since they are very rich in hydrocyanic acid.

In practical feeding, therefore, young seedlings under one foot, plants stunted owing to drought, second growths or ratoons and secondary shoots should be avoided.

It has been observed that under conditions of drought the hydrocyanic acid content of some of the crops increases to about 2½ times the original quantity. Wherever possible, either the forage affected by the above mentioned conditions should be thoroughly cured or converted into silage with water added to ensure fermentation, since it is believed that ensiling renders the hydrocyanic acid containing plants innocuous.

Feeding animals on different species of acacia is also a common practice and it is pointed out that although, as a general rule, there is little risk of poisoning as a result of the consumption of mature pods the fresh green foliage, twigs and green pods are said to be harmful at times owing to their containing hydrocyanic acid.

Linseed cake has been found to produce prussic acid poisoning and in order to destroy the enzyme or ferment responsible for liberating the hydrocyanide

from the glucoside, the cake should be treated with boiling water. The cyanogenetic gluscosides are widely distributed in plants and hydrocyanic acid has been found in 148 species of 41 families.

The chief symptoms of hydrocyanic acid poisoning are accelerated and deepened respiration, weak and irregular pulse, increased salivation and frothing at the mouth, muscular twitching, staggering as if intoxicated, anxious expression, dilatation of the pupils, convulsion, coma and death due to respiratory paralysis.

Treatment *Preventive* When climatic conditions are most favourable for hydrocyanic acid poisoning sulphur should be fed to livestock as follows :—

Two tablespoonfuls of sulphur for cattle per head per day, and one teaspoonful to sheep and goats every fourth day.

Curative Because of the rapid course of hydrocyanic (prussic) acid poisoning, it is necessary to apply the treatment without delay. Bleeding is sometimes useful in removing large quantities of absorbed hydrocyanic acid and this should be followed by intravenous injections of 10 c. c. of 20 per cent sodium nitrite solution and 30 c. c. of 20 per cent sodium thiosulphate for cattle, and a half of this dose for sheep.

Simple tests A working guide as to the poisonous nature of the fodder may be the application of the following tests:—

(1) Strips of filter paper are dipped in a saturated solution of picric acid and dried in air. The leaves of the suspected plant are macerated, preferably by adding a few drops of chloroform, to effect the release of hydrocyanic acid from the plant cells. The macerated plant material, which may have in suspected cases the odour of bitter almonds, is placed in a small bottle. When the picric acid filter paper strips are moistened with 1 per cent sodium carbonate solution and inserted with the cork in the bottle they will show the presence of hydrocyanic acid by changing colour to orange and finally to red.

(2) Cut a transverse section of the stem of suspected plant near the root, and add a small amount of tincture iodine The changing of the cut surface to blue or black indicates the presence of hydrocyanic acid.

Enough has been said in this brief survey to indicate that the losses due to fodder poisoning in India must be enormously greater than official records would suggest. It is however, realized that in a country where animal food stuffs are extremely scarce and where the average farmer is forced by poverty to rely mainly on grazing for the feeding of his cattle, complete abstinence from the only fodder available at certain seasons is scarcely practicable. ***Indian Farming, March 1943.***

Gleanings

The old order changeth—Mulch farming We are in a war we must win. Without costly soil abuse or waste, agriculture must contribute the greatest production in history All facilitating tools must be utilized. No promising methods can be left untried.

Mulch farming is such a method. It is the production of crops in imitation of Nature's way. Nature turns no plant residues under; they fall to the ground and produce a surface mulch through which succeeding crops emerge. Our reserves of soil and plant food were progressively developed under protective surface mantles of vegetation and decaying litter. Nature's method may well be imitated more closely for efficient production of agricultural crops.

Mulch farming promises increased yields and lower production costs without waste of soil. It protects soil against damage by wind and water, and it conserves moisture for crop production by increasing infiltration and retarding

evaporation. These potentialities have spotlighted this revolutionary practice, and it has already been tagged with various labels. Many call it "subsurface tillage"; others "stubble mulch" or "vegetable mulch"; "trashy tillage", "plowless fallow" or "trashy fallow", and 'stubbling-in" are older terms often used.

For generations clean tillage has been in vogue. Tradition and teaching led farmers to believe that good plowing, good coverage of crop residues and good farming were synonymous. Most of our tillage and planting equipment has been designed for this mode of culture, and the toll of erosion under this system of farming has been enormous.

The introduction of disc tillers about 1927 marked the beginning of a period during which a form of semi-covering tillage has been used extensively. Disk equipment, which partially mixes crop residue with the surface soil, replaced many plows for initial tillage, particularly in the West. Speed of travel, size, curvature and angle of discs, and number of operations largely regulated the degree of coverage obtained. Unfortunately excessive coverage and soil pulverization is too easily attained.

Previous attempts to apply the principles of mulch farming have been localized and only partially successful because of inadequate information and equipment To make more effective use of crop residue we must have equipment that tills the soil with little or no coverage of residue and determine its proper application. The new tillers of the V or straight blade type, moldboardless plows, listers, rod weeders, or cultivators with shovel and sweep adaptations, are such noncovering implements. Developing and safely introducing this initial tillage and weeding equipment and the complementary planting machinery needed to seed grasses, legumes and grains through various mulches is an essential step in tooling for this new form of tillage.

Determining the extent to which mulch farming can be successfully implemented into local cropping programmes is a challenge to farmers and conservation technicians. (*The Tropical Agriculturist, Vol. XCIX, No. 1, 1943.*)

National health in War time According to Sir John Boyd Orr, leading nutrition expert, the health of the British people is now greatly improved despite the stringency of war conditions. In a survey made in 1935, Sir John Orr found 50 per cant of the population of Britain were under-nourished owing to bad and insufficient feeding.

His latest survey, covering 1,500 families from North Scotland to south of the Thames, showed the number of under-nourished reduced by two-thirds. Boys of thirteen in Glascow, Sir John says, are now taller by an average of 0·83 inch than the immediate pre-war average, while boys of five are 0·44 inch taller. The improvement is attributed to increased milk consumption and more oatmeal and wholemeal instead of white bread. Other points made by Sir John are: the worst fed are now better fed than ever owing to rising standard of living and public health measures, including provision of dried milk, cod liver oil and other protective foods. The distribution of available food has been brought about by rationing, increased wages, and subsidies to keep essential food prices low. With less food in the country everybody is better fed including the wealthy who used to eat too much. The consumption of calcium has increased by 25 per cent, the consumption of protein and vitamin B has also gone up.

However to achieve adequate standards, British production, says Sir John, must be increased from 25 per cent in some foods to 65 per cent in the case of milk. (*The Hindu, Madras, Oct. 12, 1943.*)

Effects of Altitude on the Chemical Composition of Cultivated Plants Experimental sowings of various cultivated plants at altitudes ranging from 1,520 m. to

2,400 m , made by S. O. Grebinsky in the Alma-Ata district of Kazakhstan. produced somewhat unexpected results *(C. R. Acad, Sci. U. R. S. S , 32. No. 4 ; 1941)*. In the case of sugar beet cultivated at 2,000 m., there was more sucrose and less of the undesirable non-protein nitrogen than in the roots grown at 848 m. In peas, there was an increase in monosaccharides from 1·98 to 3·63, in sucrose from 2·65 to 5·56, and a reduction in ash from 6·77 to 3·45 per cent, when plants grown at 848 m. and 2,000 m. were compared. Tobacco (*Nicotiana rustica*) grown at 2,000 m. had 5·44 per cent nicotine, as compared with 3 58 per cent for tobacco produced at 800 m. Barley has shown a doubling of the average seed weight at high altitudes, while the grains contained less protein and more carbohydrates, which should improve the malting quality The experiments suggest that many plants do better at high altitudes, and provide a basis for large scale tests which may make it possible to utilize high mountainous regions of Middle Asia for agriculture. (*Nature, March 20, 1943.*)

A new kind of cane sugar A new method of sugar manufacture which retains the vitamin and mineral values of sugarcane juice was reported by Dr. Royal Lee, of Milwaukee, before the annual convention of the Northeastern Dental Association at Swampscott, Mass., on June '28. The outstanding feature of the process as described by the discoverer is that it does not involve heating the juice. It was described as a dehydration process, the first step in which consists in filtering the cane juice and using a solvent to kill bacteria. The solvent evaporates. The juice is then frozen, forming ice crystals composed of pure water mingled with a solution which has become more concentrated by the removal of the water which forms the ice crystals. This, the inventor said, was the process used in the backwoods manufacture of apple-jack. The third step consists of chipping the frozen mass and centrifuging it. This discharges the sugar solution leaving the pure water ice behind. Repetition of the freezing and centrifuging procedure several times produced a cold process syrup, to which was added a small quantity of a grain extract which had the property of altering the attraction of the cane juice for water, making it less hygroscopic. The syrup could then be readily dried to a crystal or powder form. The result was described as a cream coloured, sweet tasting product with a pleasant, distinctive flavour, differing from other sugars in possessing a tartness like that of very sweet orange juice. Dr. Lee said that the sugar thus produced, which he called "vital sugar" contained 3½% of mineral elements, largely calcium. and that the vitamin content included vitamins A, B complex, C and K, the last of which is highly effective against tooth decay. The inventor also claimed that twice as much sugar could be made from the same amount of cane juice by his process as by the customary refining process. Commercial application of the product was expected to be found in the candy, beverage and baking industries, and for special diets.

(*Sugar, August 1943.*)

Hints for Bee-keepers

For December

The month continues to be favourable for bee activity both as regards climate as well as pasturage conditions. The weather is generally mild with chill nights and bright days. The pollen sources comprise of maize, *cumbu*, *Ailanthus excela*, zinnia, sunflower and niger, and those of nectar Cambodia cotton, sunflower and niger. There is rapid comb-construction and brisk breeding. Necessary facilities may be given to accelerate these. In strong colonies excessive drone-breeding and construction of queen cells may occur. Superfluous drones and drone-brood should be destroyed. The first swarm may be allowed to come out and hived as a separate colony and the issue of subsequent

ones prevented. Honey also may be found stored in appreciable quantities in strong colonies and these should be given supers.

Colonies occurring in nature are generally in prime condition during the month. As the weather and pasturage conditions are quite favourable these colonies stand their capture and the subsequent shifting very well. The amateur may, therefore, take this opportunity to hive them and increase his stock. The success of hiving them lies in securing all the brood combs undamaged along with the bees and queen, and in the after-care of these captures, details of which are furnished in the Bulletin No. 37 of the Department of Agriculture, Madras. The hives should be located in a shady place with adequate protection against the bee-enemies, strong winds, sun and rain, and within easy reach of a good supply of pasturage.

M. C. Cherian and S. Ramachandran

Correspondence

ROSES Vs. CAULIFLOWERS

The Nation's demand to Grow More Food aroused my feelings of responsibility to the Fighting Front. I had planted roses in a block of 18 cents in the first week of June 1942. I felt I had wasted the precious 18 cents. A flash came into my mind and I sowed dry crop paddy seed about 5 lb., in the same plot of 18 cents. It gave me a good crop of nearly two bags (each bag 166 lb.) of paddy but the rose plants became pale and looked shabby. After cutting the paddy good ventilation helped the rose plants and in about 20 days the plants adjusted themselves and put up a healthy growth. I turned over the soil once and after a good aeration applied ½ lb. of groundnut cake and three handfuls of well rotten cow dung per plant and thoroughly watered them. In a month fresh shoots came. Meanwhile I prepared a seed bed of Early—Patna—cauliflower, and Early Drumhead cabbage and transplanted the seedlings between the rows of rose plants. This was in the month of November 1942. Nearly 500 plants of cauliflower, and 200 plants of Early Drum-head cabbage were planted. After 20 days the first dressing of light manure was given. A fortnight later pig manure, well rotten and powdered, was applied. and watered thoroughly every ten days. The crop grew so well that even in the congenial climate of hills, you could not raise such fine cauliflower, some of which weighed even 5 lb. each, the minimum weight being ½ lb. Nearly 1,350 lb. of cauliflower and 450 lb. of cabbages, I could get. There was an attack of caterpillars on cabbage and the crop suffered a good deal.

I applied groundnut cake to the paddy field at the rate of 246 lb. per acre. Even though the transplanting had taken place as late as August, the crop was good and 19 bags (each bag 166 lb.) per acre was the result with Samalkota No. 15 paddy variety. Leaving the old traditions to the wind, pig manure was applied with good results to the paddy.

Young India has a good deal to do. It can universally raise good crops by using good manures like oil cakes. The time has come to act. Everybody to his post—act and get—why get—it must come—what?—the result—the bumper crop.

Pithapuram

(Sd.) V. G. Krishna

Crop and Trade Reports

Paddy—First Report—1943-44 The average area under paddy in the Madras Province during the five years ending 1941-42 represents 13·3 per cent of the total area under paddy in India. The area sown with paddy up to the 25th September, 1943 is estimated at 6,582,000 acres. When compared with the area of 6,179,000 acres estimated for the corresponding period of last year, it reveals an increase of 6·5 per cent. The area estimated is the same as that of last year in Coimbatore. An increase in area is estimated in the other districts of the

Province except in Vizagapatam, Kurnool, Anantapur, Chingleput, South Arcot, Trichinopoly, Tanjore and Ramnad. The variations are marked in Kistna (+118,000 acres), Chingleput (−99,000 acres), Chittoor (+103,000 acres), North Arcot (+127 000 acres), Tanjore (−128,000 acres) and Malabar (+72,000 acres). The increase in area is attributed partly to the 'Grow more food campaign' and partly to the prevalence of high prices for paddy.

The first crop of paddy is being harvested in parts of the district of East Godavari, Chingleput, North Arcot, Salem, Coimbatore, Trichinopoly, Tanjore, Madura, Malabar and South Kanara. The yield per acre is expected to be normal in Chingleput, North Arcot, Salem, Coimbatore and Trichinopoly and slightly below the normal in parts of East Godavari, Tanjore, Madura, Malabar and South Kanara. The condition of the standing crop is generally satisfactory.

The average wholesale price of paddy, second sort, per imperial maund of 82⅔ lbs as reported from important markets on 9th October 1943, was Rs. 7—10—0 in Mangalore, Rs. 6—10—0 in Madura, Rs. 6—8—0 in Vellore, Rs. 6—1—0 in Guntur, Rs. 6—0—0 in Masulipatam and Tinnevelly, Rs. 5—13—0 in Bezwada, Rs. 5—11—0 in Ellore, Rs. 5—9—0 in Cocanada, Rs. 5—7—0 in Rajahmundry, Rs. 5—6—0 in Conjeevaram, Rs. 5—3—0 in Trichinopoly, Rs. 4—15—0 in Kumbakonam, Rs. 4—14—0 in Negapatam and Re. 4-12-0 in Cuddalore. When compared with the prices published in the last report, i. e., those which prevailed on 6th February 1943, these prices reveal a rise of 39 per cent in Nagapatam, 25 per cent in Kumbakonam, 22 per cent in Trichinopoly, 20 per cent in Masulipntam, and Guntur, 19 per cent in Madura, 17 per cent in Cocanada, 16 per cent in Bezwada, 14 per cent in Ellore, 13 per cent in Vellore and 7 per cent in Rajahmundry and a fall of 16 per cent in Tinnevelly and 4 per cent in Cuddalore. (*From the Commissioner of Civil Supplies, Madras*).

Paddy—Intermediate Condition report 1943-44 The harvest of first crop of paddy has either concluded or is concluding in parts of Chingleput, the Central districts, the South and the West Coast. The yield per acre is reported to be normal in the Central districts and generally below the normal elsewhere. The condition of the main crop of paddy is generally satisfactory in all the districts except in Chingleput where the heavy rains of October affected the standing crop to some extent.

The wholesale price of paddy, second sort, per imperial maund of 82⅔ lbs. as reported from important markets on 6th November 1943 was Rs. 8—3—0 in Madura, Rs. 7—9—0 in Mangalore, Rs. 6—8—0 in Vellore, Rs. 6—4—0 in Nellore, Rs 6—3—0 in Ellore and Guntur, Rs. 6—2—0 in Masulipatam, Rs 6—1—0 in Bezwada, Rs. 6 in Tinnevelly, Rs. 5—13—0 in Cocanada, Rs. 5-7-0 in Rajahmundry, Rs. 5-4-0 in Trichinopoly, Rs. 4-15-0 in Kumbakonam, Rs. 4-14-0 in Negapatam, Rs. 4-2-0 in Cuddalore and Rs. 4-1-0 in Conjeevaram. When compared with the prices published in the last report, i. e., those which prevailed on 9th October 1943, these prices reveal a rise of approximately 24 per cent in Madura, 9 per cent in Ellore, 5 per cent in Cocanada, 4 per cent in Bezwada, 2 per cent in Masulipatam, and Guntur and 1 per cent in Trichinopoly and a fall of approximately 24 per cent in Conjeevaram, 13 per cent in Cuddalore and 1 per cent in Mangalore, the prices remaining stationary in Rajahmundry, Vellore, Kumbakonam, Nagapatam and Tinnevelly. (*From the Commissioner of Civil Supplies, Madras*)

Sugarcane—Second report—1943 The average area under sugarcane in the Madras Province during the five years ending 1941-42 represents 3·1 per cent of the total area under sugarcane in India. The area planted with sugarcane up to the 25th September 1943 is estimated at 138,150 acres. When compared with the area of 116,390 acres estimated for the corresponding period of the previous year, it reveals an increase of 18·7 per cent. A slight decrease in area is revealed

in Vizagapatam, East Godavari, Guntur, Kurnool, Ramnad and Tinnevelly and the area has increased in the other districts, especially in Anantapur (+1,070 acres), South Arcot (+5,250 acres). Chittoor (+3,000 acres), North Arcot (+4,400 acres), Salem (+1,300 acres). Trichinopoly (+4,200 acres) and Madura (+1,400 acres). The increase in area is due mainly to the high price of jaggery at the time of planting.

The condition of the crop is satisfactory on the whole. The seasonal factor for the Province as a whole works out to 100 per cent as against 97 per cent for the corresponding period of last year. The total yield for the Province in terms of jaggery is accordingly estimated at 422,550 tons as against 343,110 tons for the corresponding period of last year representing an increase of 23·2 per cent.

The wholesale price of jaggery per imperial maund of 82⅔ lb. as reported from important markets on 9th October 1943 was Rs. 15-13-0 in Erode, Rs. 13-13-0 in Salem, Rs. 13—8—0 in Vizagapatam, Rs. 12—12—0 in Cuddalore, Rs. 12—6—0 in Rajahmundry, Rs. 11—12—0 in Mangalore, Rs. 11—8—0 in Cocanada, Rs 11—2—0 in Bellary, Rs 10-4-0 in Trichinopoly and Chittoor, Rs. 10-1-0 in Vizianagaram and Adoni, Rs. 9-8-0 in Vellore and Rs. 9-2-0 in Coimbatore. When compared with the prices published in the last report, i. e., those which prevailed on 4th September 1943, the above prices reveal a rise of approximately 24 per cent in Cocanada 10 per cent in Cuddalore and 8 per cent in Rajahmundry and a fall of approximately 18 per cent in Coimbatore, 10 per cent in Trichinopoly, 8 per cent in Vellore, 6 per cent in Mangalore, 2 per cent in Salem and 1 per cent in Chittoor, the prices remaining stationary in Vizianagaram, Adoni, Bellary and Erode. (*From the Commissioner of Civil Supplies, Madras*)

Groundnut—Third forecast report—1943 The average area under groundnut in the Madras Province during the five years ending 1941-1942 represents 42·4 per cent of the total area under groundnut in India. The area sown with groundnut up to 25th September 1943 is estimated at 2,911,000 acres. When compared with the area of 2,799,200 acres estimated for the corresponding period of the previous year it shows an increase of 4·0 per cent. The area estimated is the same as that of last year in Tinnevelly. An increase in area is estimated in the other districts of the Province except in the Deccan, Nellore, Chittoor, North Arcot, Salem and Trichinopoly and is due mainly to the prevalance of high prices for groundnut. The variations are marked in Vizagapatam (+48,000 acres), Kistna (+115,000 acres), Bellary (-113,000 acres), Anantapur (-40,000 acres) and South Arcot (+103,000 acres).

The summer crop has been harvested. The yield was normal except in parts of Chingleput, South Arcot and Ramnad where it was slightly below normal. The yield of the early crop was normal in Coimbatore and below the normal in Salem due to unfavourable weather conditions and to insect attacks in parts.

The condition of the main crop is reported to be satisfactory outside Vizagapatam, Kistna, Guntur, the Deccan (Cuddapah excepted), Salem and Madura where it was affected by drought to some extent in the early stages of its growth. In parts of Salem and Madura, the crop suffered in some degree from attacks by insect pests.

The wholesale price of groundnut (machine shelled) per imperial maund of 82⅔ lb. as reported from important market centres on the 16th October 1943 was Rs. 12—9—0 in Vizianagaram and Bellary, Rs. 12 6—0 in Erode, Rs. 12—5—0 in Cuddapah, Rs. 12—4—0 in Adoni, Rs. 12—1—0 in Guntur, Cuddalore and Vellore, Rs 11—13—0 in Hindupur, Rs 11—5—0 in Nandyal, Rs 11—4—0 in Guntakal, Rs. 11—3—0 in Salem, and Rs. 10—9—0 in Vizagapatam. When compared with the prices published in the last report, i. e., those which prevailed on 7th August 1943, these prices reveal a fall of 17 per cent in Vizagapatam, 13 per cent in Guntakal, 10 per cent in Salem, 9 per cent in Nandyal, 6 per cent in Erode, 4 per

cent in Vizianagaram, Guntur, Cuddapah, Cuddalore and Vellore, 2 per cent in Hindupur, and one per cent in Adoni, the price remaining stationary in Bellary.

(From the Commissioner of Civil Supplies, Madras)

Groundnut—Intermediate condition report—1943–44 The winter crop of groundnut has been affected to some extent by drought in the early stages of its growth in parts of Kistna, Guntur, Nellore, and Salem, by the heavy rains of October in parts of Chingleput and North Arcot and by insect pests in parts of Salem. The condition of the crop is generally satisfactory in the other districts.

The wholesale price of groundnut (machine shelled) as reported from important market centres on 6th November 1943 per imperial maund of 82⅔ lb. was Rs 12-9-0 in Bellary, Rs 12-1-0 in Adoni, Rs 11-11-0 at Cuddapah and Vizagapatam, Rs. 11-9-0 at Vizianagaram, Rs 11-4-0 at Guntakal, Rs. 11-3-0 at Nandyal, Vellore, Cuddalore and Erode, Rs. 11-0-0 at Salem and Rs. 10-15-0 at Guntur. When compared with the prices published in the last report, i. e., those which prevailed on 16th October 1943, these prices reveal a fall of 10 per cent at Erode and Guntur, 8 per cent at Vizianagaram, Vellore and Cuddalore, 5 per cent at Cuddapah, 2 per cent at Adoni and 1 per cent at Nandyal and Salem and a rise of 11 per cent at Vizagapatam; the prices remaining stationary at Guntakal and Bellary. *(From the Commissioner of Civil Supplies, Madras)*

Gingelly—Second forecast report—1943-1944 The average area under gingelly in the Madras Province during the five years ending 1941-1942 represents 15·6 per cent of the total area under gingelly in India. The area sown with gingelly up to the 25th September 1943 is estimated at 472,000 acres. When compared with the area of 490,500 acres estimated for the corresponding period of last year, it reveals a decrease of 3·8 per cent. The estimated area is the same as that of last year in South Kanara. An increase in area is estimated in East Gadavari, (+11,000 acres), West Godavari, Kistna, Guntur, Bellary, Cuddapah, Nellore, Chingleput, Coimbatore, Tinnevelly and Malabar and a decrease in area in the other districts of the Province.

The early crop of gingelly has been harvested in parts. The yield per acre was normal except in parts of Vizagapatam, Kistna, Salem, and Coimbatore. The main crop of gingelly was affected by drought to some extent in the early stages of its growth in the Deccan. The condition of the crop is fairly satisfactory in the other districts of the Province.

The wholesale price of gingelly per imperial maund of 82⅔ lb. as reported from important markets on 16th October 1943 was Rs. 18-7-0 in Trichinopoly, Rs. 16-5-0 in Salem, Rs. 15-15-0 in Tinnevelly, Rs. 15-14-0 in Ellore, Rs. 15-11-0 in Cuddalore, Rs. 15-8-0 in Tuticorin, Rs. 15-1-0 in Cocanada, Rs. 14-14-0 in Rajahmundry, Rs. 14-13-0 in Vizagapatam and Rs. 13-5-0 in Vizianagaram. When compared with the prices published in the last report, i. e., those which prevailed on 7th August 1943, these prices show a rise of 28 per cent in Vizagapatam, 17 per cent in Trichinopoly, 14 per cent in Ellore, 11 per cent in Cocanada and Rajahmundry, 7 per cent in Tinnevelly, 6 per cent in Salem, 5 per cent in Tuticorin and 2 per cent in Cuddalore, the price remaining stationary in Vizianagaram.

(From the Commissioner of Civil Supplies, Madras)

Cotton—Second forecast report—1943–44 The average of the areas under cotton in the Madras Province during the five years ending 1941–42 represents 9·8 per cent of the total area under cotton in India. The area under cotton up to 25th September 1943 is estimated at 744,100 acres. When compared with the area of 856,900 acres estimated for the corresponding period of last year, it reveals a decrease of 13·2 per cent.

Central Districts and South—mainly Cambodia tract The area in the Central districts and the South relates partly to the last year's crop and partly to the current year's sowings which have commenced in parts.

White and Red Northerns tract The area under White and Red Northerns rose from 100,000 acres to 103,000 acres, i e., by 3·0 per cent.

Westerns tract The area under Westerns fell from 438,000 acres to 367,200 acres, i. e., by 16·2 per cent. The decrease in area occurs mainly in Bellary and Cuddapah and is due chiefly to the prohibition of the cultivation of pure *mungari* cotton.

Warangal and Cocanadas tract The area under Warangal and Cocanadas cotton fell from 80,800 acres to 72,000 acres, i. e., by 10·9 per cent. The decrease in area occurs mainly in Guntur due to increase in the area under food crops.

The condition of the crop is generally satisfactory in all the districts.

The average wholesale price of cotton lint per imperial maund of 82⅔ lb. as reported from important markets on 2nd October 1943 was Rs. 37--1—0 for Cocanadas Rs. 34-13-0 for White Northerns, Rs. 34-9-0 for Red Northerns. Rs. 31-15-0 for Westerns (*Mungari*. Rs. 29—2—0 for Westerns (*Hingari*), Rs. 74—15—0 for Coimbatore Cambodia, Rs. 55—0—0 for Virudhunagar, (Southern) Cambodia, Rs 62—3--0 for Coimbatore *Karunganni*, Rs. 50—11--0 for Tinnevellies and Rs. 38—5—0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 4th September 1943, these prices reveal a rise of approximately 7 per cent in the case of Tinnevellies, 6 per cent in the case of Virudhunagar (Southern) Cambodia, 4 per cent in the case of Coimbatore *Karunganni*, 3 per cent in the case of *Nadam* cotton and 2 per cent in the case of Coimbatore Cambodia. The prices of Cocanadas, White Northerns, Red Northerns and Westerns (*Mungari* and *Hingari*) remained stationary. (*From the Commissioner of Civil Supplies, Madras*)

Cotton—Intermediate condition report—1943-44 In the central districts and the south the sowings of cotton are still in progress. The area under the crop is reported to be normal or slightly above normal in the south and slightly below normal in the central districts due chiefly to the food production drive.

In the Deccan the sowings of *hingari* or late sown cotton are reported to be almost normal. The yield of the *mungari* or early sown crop is expected to be below normal in parts of the Deccan due to the set back in the early stages of its growth and the prolonged wet weather in September and October.

The local cotton trade is not generally active at this time of the year. The average wholesale price of cotton lint per imperial maund of 82⅔ lb. as reported from important markets on 8th November 1943 was Rs 37—14—0 for Cocanadas, Rs. 34-13-0 for White Northerns, Rs. 34-9-0 for Red Northerns, Rs. 27-3-0 for Westerns (*Mungari*), Rs. 21-1-8 for Westerns (*Hingari*), Rs. 71-12-0 for Coimbatore Cambodia, Rs. 60-2-0 for Coimbatore *Karunganni* and Rs. 37-4-0 for *Nadam* cotton. When compared with the prices published in the last report, i. e., those which prevailed on 2nd October 1943, these prices reveal a rise of approximately 2 per cent in the case of Cocanadas and a fall of approximately 15 per cent in the case of Westerns (*Mungari*), 28 per cent in the case of Westerns (*Hingari*), 4 per cent in the case of Coimbatore Cambodia and 3 per cent in the cases of Coimbatore *Karunganni* and *Nadam*, the prices remaining stationary in the case of White and Red Northerns, (*From the Commissioner of Civil Supplies, Madras.*)

Cotton, raw, in the Madras Province The receipts of loose cotton at presses and spinning mills in the Madras Province from 1st February to 29th October, 1943 amounted to 368,349 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942—43 The receipts in the corresponding period of the previous year were 641,278 bales. A total quantity of 553,260 bales mainly of pressed cotton was received at spinning mills and 1,908 bales were exported by sea while 226,556 bales were imported by sea mainly from Karachi and Bombay. (*From the Director of Agriculture, Madras.*)

College and Estate News

Students' Corner—Students' Club Under the auspices of the Students' Club a meeting was held on 25th October '43 when Sri C. Vincent read a paper on the 'Sons of the soil'. Sri T. Nataraj, B. A., B. Sc., Ag. presided.

At another meeting held on the 19th November '43, Mr. Rhind, Economic Botanist, Burma, gave a resume of the work done on *sesamum*. Sri C. M. John, Oil Seeds Specialist, occupied the chair.

Games *Hockey* Two matches were played against R. S. Puram and Sporting Union teams; the former ended in a draw and in the latter we were successful.

In the series of matches played in connection with the Coimbatore Athletic Association Hockey Tournament our team came out successful and has reached the finals.

Cricket .The Rhondy Shield match played against Stanes' European High School could not be completed. We were defeated by 2 runs and 4 wickets in a trial against the R. I. N. team.

The match with Officers XI ended in time draw. Officers XI–152. (S. D. S. Albuquerque 38, K. M. Thomas 31, C. Ramaswami 29, K. S Alwa 3 for 21, R. Narasimham 4 for 43) Students' XI—113, (R. Narasimham 47 not out, A. S. Krishnan 36, M. Mukundan 5 for 43)

Educational Tour The students of B. Sc (Ag.) class III were taken on a tour from 1st to 13th November '43. The party was led by Sri V. T. Subbiah Mudaliar, Junior Lecturer in Agriculture; Sri K. C. Ramkrishnan, Lecturer in Agricultural Economics and Sri A. H. Subramania Sarma, teaching Assistant in Agriculture accompanied the party. In the tour, Tanur, Calicut, Taliparamba, Kasaragode and Mangalore were visited for the study of local agriculture and experimental work in the Agricultural Research Stations of the West Coast.

The Agricultural Officers' Club Day The annual club day was celebrated on 30th October '43 with great *eclat*. The annual dinner was held on the 29th night and rest of the activities connected with the club day was held on the 30th amidst a variety of interesting games and amusements. The President Sri V. T. Subbiah Mudaliar distributed the prizes to the winners in the several competitions.

The Agricultural College Ladies' Club Day The annual club day was celebrated on 20th November '43 A large number of ladies and children of the estate participated in the sports and entertainments. The President, Mrs. P. D. Karunakar gave away the prizes to the winners. Mrs. P. D. Karunakar won the championship cup. The function terminated with the distribution of sweets and pansupari.

OBITUARY

We regret to report the untimely passing away of Sri K. R. Ramaswami, B. Sc. Ag., under very tragic circumstances. He took his degree in 1931, and worked as a fieldman until very recently when he was promoted and posted as Agricultural Demonstrator, Salem.

Brilliant in his studies, unostentatious in his work, he endeared himself to one and all. We convey our heart felt condolences to the members of the bereaved family.

Departmental Notifications

Gazetted Service—Appointments

Sri G. Seshadri Aiyengar, a servant of the Indian Central Cotton Committee, is appointed to act as Assistant Cotton Specialist, Mungari Cotton Improvement Scheme, Adoni, Bellary District.

Sri M. Bhavani Shanker Rao, Assistant in Oil Seeds Section, is appointed to act as Assistant Oil Seeds Specialist, for the Scheme of Research on storage of Groundnut in Madras.

Sri V. Achyutharamayya, F. M. A R. S. Samalkota, is appointed as District Agricultural Officer for special duty on Pest Act work.

Sri E. R. Gopala Menon, Assistant in Entomology, is appointed to act as Assistant Entomologist for the scheme of research on insect pests of stored oil seeds (groundnuts).

Sri V. Margabhandu, Assistant in Entomology, is appointed to act as Assistant Entomologist, Coimbatore with effect from the date of taking charge, *vice* Sri P. N. Krishna Ayyar granted leave.

Sri K. Govindan Nayar, Assistant in Chemistry is re-appointed to officiate as Assistant Agricultural Chemist, Coimbatore, *vice* Sri M. Suryanarayana, granted leave.

Sri G. Sakharama Rao, A. D. Karkal, is re-appointed to officiate as District Agricultural Officer, Trichinopoly, *vice* Sri T. G. Anantarama Ayyar, granted leave.

Sri V. Sadagopa Ayyangar, A. D (Tanjore District) to officiate as Assistant Marketing Officer, Madras for grading and marketing of certain superior varieties of rice.

Sri S. Venkatarama Ayyar, F M. A. R. S. Palur to officiate as District Agricultural Officer, Nellore.

Transfers

Sri A. Gopalakrishniah Nayudu, D. A. O. Nellore to be D. A. O. Guntur.

Sri A. Chidambaram Pillai, D. A. O. Guntur to officiate as Asst. Marketing Officer, Madras.

Leave

Sri A. Ramaswami Ayyar, Assistant Marketing Officer, Madras, is granted leave on half average pay for 6 months and 15 days from 15—8—'43.

Subordinate Services—Promotions

The following promotions as Upper Subordinates in the new III Grade have been ordered with effect from 15-11-43.

Sri N. Muthuswami Nayudu, Laboratory Assistant in Entomology section, to officiate as Assistant in Entomology Section, Coimbatore.

Sri I. L. Narasimhalu, Laboratory Assistant in Mycology section, to be temporary Assistant in the Mycology section, Coimbatore.

Sri J. Vaidyanathan, fieldman A. R. S Palur to officiate as F. M. A. R. S. Palur.

Sri A. V. Parthasarathi, Fieldman A. R. S. Hagari, to officiate as Assistant in Millets, A. R. S. Hagari.

Sri K. R. Ramaswami, Fieldman A. R. S. Palur to officiate as A. D. Salem District,

Sri A. G. Kesava Reddi, Fieldman A. R. S. Hagari to officiate as A. D. Anantapur District.

Sri S. Arunachalam, Fieldman, A. R. S. Tindivanam, to be temporary Assistant in Oil Seeds at Tindivanam.

Sri E. S. Kothanda Raman, Fieldman, Paddy section, Coimbatore to officiate as Agricultural Marketing Assistant, Madras.

Sri K. Kelukutti Menon, Fieldman, Paddy section, Coimbatore, to officiate as Assistant in Oil Seeds section, Coimbatore.

Sri K. Santhanam, Fieldman Central Farm, Coimbatore, to officiate as Upper Subordinate Agricultural Section.

Sri K. R. Sundaresan, Fieldman, S. R. S. Gudiyattam; to officiate as A. D N. Arcot, District.

The following candidates are appointed to officiate as Upper Subordinates in the III Grade with effect from 15—11—'43.

Name of officer	Posting
Sri Vaddi Rama Rao	A. D. West Godavari Dt.
Janab Mirsa Anser Baig Sahib	A. D. Bellary Dt.
,, C. V. Ummer Kutty Sahib	A. D. Malabar Dt.
,, D. A. Syed Muhammed Sahib	A. D. Salem Dt.
,, K. A. Shaukat Ali Sahib	A. D Trichinopoly Dt.
Mr. George H. Maduram	A. D. Tinnevelly Dt.
Sri A. Radhakrishna Reddi	A. D. Chingleput Dt.
,, T. V. Palaniswami	A. D. Coimbatore Dt.
,, C. Srinivasan	A. D Chittoor Dt.
,, R. Narayanamurthi	A. D. Guntur Dt.
,, S. T. Srinivasan	A. D. Ramnad Dt.
,, C. R. Thiruvengadam	A. D. North Arcot Dt.
,, T. Sivasubramaniam	A. D. South Arcot Dt.
,, M. Dhanvantari Reddi	A. D. Nellore Dt.
,, T. P. Shanmuga Nayanar	A. D. Madura Dt.
,, G. Prabhakara Reddi	A. D. Anantapur Dt.
,, M. Murthi Raju	A. D. Kandukur, Nellore Dt.
,, P. K. Sivasubramaniam	A. D. Tanjore Dt.
,, G. Venkataramana Reddi	A. D. Chittoor Dt.
,, R. Narasimha Reddi	A. D. Kurnool Dt.
,, V. Ramanna	A. D. Guntur Dt.
,, K. Srinivasan	A. D. Chittoor Dt.
,, B. Hanumantha Rao	A. D. Cuddapah Dt.
,, N. V. Gopalakrishna Sarma	A. D. Kurnool Dt.
,, K. Ramakrishna Sastri	A. D. Kanigiri, Nellore Dt.
,, K. Thandavarayan	Asst. in Oil Seeds, Groundnut Storage Scheme, Cuddalore
,, C. V. Govindaswami	Assistant in Mycology, Coimbatore
,, N. Ramesh Adyanthayya	do. do. do.
,, I. Achyutarama Raju	Assistant in Entomology, Coimbatore
,, K. Ranga Rao	Assistant in Fruits, College Orchard, Coimbatore
,, C. Ramakanta Reddi	A. R. S. Samalkota
,, Y. R. Sundara Rao	Asst. in Oil Seeds, Groundnut Storage Scheme, Masulipatam
,, T. K. Tiruvengadachari	Assistant in Chemistry, Siruguppa
,, K. V. S. Suryanarayanamurthi	Assistant in Chemistry, Coimbatore
,, K. Sambamurthi	Assistant in Fruits, Bio-Chemistry Section, F. R. S. Kodur
,, G. R. Padaki	Asst. in Cotton, Mungari Scheme, Adoni

Posting and Transfers

Name of officer	From	To
Sri K. Narayana Kamath	A. D. under training in Malabar District	A. D. Coimbatore
,, G. Ramalingam	A. D under training in Darsi (Nellore Dt.)	F M. A. R. S. Guntur
,, M. Satyanarayana	F. M. A R. S. Guntur	A. D. Cocanada
,, A. Rama Doss	A. D. Arantangi	A. D. Virdhachalam
Janab S. Khadir Razak Sahib	A. D. Koilkuntla	A. D. Cuddapah
Sri J. V. V. Suryanarayana	Asst. in Chemistry, Siruguppa	A. D. Amalapuram
,, L. Krishnan	F. M. A. R. S. Palur	A. D. Utbamapalayam
,, K. Varadachari	A. D. Gooty	A. D. Saidapet
,, P. Lakshmana Babu	A. D. under training in Kistna Dt.	A. D. Vizagapatam
,, A. Subba Raju	Asst. in Cotton, Mungari Scheme, Adoni	A. D. in Kistna Dt. for training
,, M. Damodara Prabhu	F. M. A. R. S Kasargod	A. D. Mangalore
,, K. Rajasekhara Shetty	F. M. Siruguppa	Asst. in Fruits, A. R. S Taliparamba
,, T. Gopalan Nayar	Asst. in Fruits, A. R. S. Taliparamba	A. D. Palghat
,, K. Govindan Nambiar	A. D. Palghat	A. D. Calicut
,, A. Venkatarangam	A. D Rapur	A. D. Nellore
,, U. Sanyasi Rao	Under training at Sulurpet	A. D. Rapur
,, G. Ramalingam	A. D. Kandukur	A. R. S. Guntur
Janab K. Fazlulla Khan Sahib	Asst. in Fruits, College Orchards, Coimbatore	Asst. in Charge of Kallar and Burliar Fruit Stations, Mettupalayam
Sri R. Shanmukha-sundaram	Kallar and Burliar Fruit Station, Mettupalayam	Asst. in the Scheme for Banana fibre, College Orchards, Coimbatore
Janab Muhamad Faziuddin	A. D. Nandigama	Food Inspector, under Grain Purchase Officer, Tadepalligudem
Sri Achyutan	A. D. Tiruvur	do.
,, G. Sitarama Sastri	A. D. Sattanapalli	do.
,, K. Mahabala Shetty	A. D. Kudligi	A. D. Hospet
,, T. D. Muthuswamy	A. D. Siruguppa	A. D. Adoni
,, S. Krishnamurthi Rao	A. D. Alur	A. D. Bellary

Leave

Name of officer	Period of leave
Sri R. Narasimha Ayyar, A. D in Mycology, Vellore	L. a. p. for 1 month from 10-11-43
,, K. L. Ramakrishna Rao, A. D. Tiruttani	L a. p for 1 month from 4-12-43
,, P. Vishnu Somayajulu, Asst. in Mycology, Coimbatore	L. a. p. for 3 months from 1-12-43 preparatory to retirement
,, S. V. Naidu, A. D. Markapur	Extension of leave on half average pay on m. c. for 4 months from 2-10-43
,, N. S. Rajagopala Ayyar, A.D, Cheyyar	L. a. p. for 1 month from 25-10-43
,, V. Gomathinayagam Pillai, Asst. in Millets Section, Coimbatore	L. a. p. for 1 month from 1-11-43
,, K. Sitarama Ayyar, A. D. Attur	Extension of l. a. p. for 4 months from 7—7—43
,, N. Krishna Pillai, A. D. Pollachi	Extension of l. a. p. for one and half months